SEQUENCE LISTING

<110> Daniel H. Cohn
 Muhammad Faiyaz ul Haque
 Lily M. King
 Deborah Krakow

<120> 3-PHOSPHOADENOSINE-5-PHOSPHOSULFATE
 (PAPS) SYNTHETASE PROTEINS AND METHODS FOR TREATING
 OSTEOARTHRITIC DISORDERS

<130> 18810-81552

<140> Unassigned

<141> 2001-07-02

<150> 09/399,212

<151> 1999-09-17

<160> 28

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 2014

<212> DNA

<213> Homo sapiens

<400> 1

etgetgeege egeegeege geegteett egteettegg tetetgetee egggaeeegg 60 cteegeegea geeageeage atgtegggga teaagaagea aaagaeggag aaceageaga 120 aatccaccaa tgtagtctat caggcccacc atgtgagcag gaataagaga gggcaagtgg 180 ttggaacaag gggtgggttc cgaggatgta ccgtgtggct aacaggtctc tctggtgctg 240 gaaaaacaac gataagtttt geectggagg agtaeettgt eteceatgee atecettgtt 300 actecetgga tggggacaat gteegteatg geettaacag aaatetegga tteteteetg 360 gggacagaga ggaaaatatc cgccggattg ctgaggtggc taagctgttt gctgatgctg 420 gtotggtotg cattaccago tttatttoto cattogcaaa ggatogtgag aatgcccgca 480 aaatacatga atcagcaggg ctgccattct ttgaaatatt tgtagatgca cctctaaata 540 tttgtgaaag cagagacgta aaaggcctct ataaaagggc cagagctggg gagattaaag 600 gatttacagg tattgattct gattatgaga aacctgaaac tcctgagcgt gtgcttaaaa 660 ccaatttgtc cacagtgagt gactgtgtcc accaggtagt ggaacttctg caagagcaga 720 acattgtacc ctatactata atcaaagata tccacgaact ctttgtgccg gaaaacaaac 780 ttgaccacgt ccgagctgag gctgaaactc tcccttcatt atcaattact aagctggatc 840 tccagtgggt ccaggttttg agcgaaggct gggccactcc cctcaaaggt ttcatgcggg 900 agaaggagta cttacaggtt atgcactttg acaccctgct agatgatggc gtgatcaaca 960 tgagcatccc cattgtactg cccgtctctg cagaggataa gacacggctg gaagggtgca 1020 gcaagtttgt cctggcacat ggtggacgga gggtagctat cttacgagac gctgaattct 1080 atgaacacag aaaagaggaa cgctgttccc gtgtttgggg gacaacatgt acaaaacacc 1140 cccatatcaa aatggtgatg gaaagtgggg actggctggt tggtggagac cttcaggtgc 1200 tggagaaaat aagatggaat gatgggctgg accaataccg tctgacacct ctggagctca 1260 aacagaaatg taaagaaatg aatgctgatg cggtgtttgc attccagttg cgcaatcctg 1320 tccacaatgg ccatgccctg ttgatgcagg acacctgccg caggctccta gagaggggct 1380 acaagcaccc ggtcctccta ctacaccctc tgggcggctg gaccaaggat gacgatgtgc 1440 ctctagactg gcggatgaag cagcacgcgg ctgtgctcga ggaaggggtc ctggatccca 1500



```
<210> 3
<211> 20
<212> DNA
<213> Homo sapiens
```

<400 tgga		agg a	atgad	cgate	gt											20
<212	.> 20 ?> DN	1A	sapie	ens												
<400 cgga		atg g	gcaad	caato	a g											20
<212	.> 20 ?> DN	IA	sapie	ens												
<400 ctgg		gg a	aaaa	acaad	cg											20
<212	.> 22 !> DN	ΙA	sapie	ens												
<400 tgcc		gga g	gaaat	caaag	gc to	3										22
<212	.> 61 !> PF	TS	sapie	ens												
<400				_	_		_	_,		_			_	_	m1	
Met 1	Ser	GIY	Ile	Lys 5	Lys	Gln	Lys	Thr	GIu 10	Asn	GIn	GIn	Lys	Ser 15	Thr	
Asn	Val	Val	Tyr 20	Gln	Ala	His	His	Val 25	Ser	Arg	Asn	Lys	Arg 30	Gly	Gln	
Val	Val	Gly 35		Arg	Gly	Gly	Phe 40		Gly	Cys	Thr	Val 45	Trp	Leu	Thr	
Gly	Leu 50	Ser	Gly	Ala	Gly	Lys 55	Thr	Thr	Ile	Ser	Phe 60	Ala	Leu	Glu	Glu	
Tyr 65		Val	Ser	His	Ala 70		Pro	Cys	Tyr	Ser 75	Leu	Asp	Gly	Asp	Asn 80	
	Arg	His	Gly	Leu 85		Arg	Asn	Leu	Gly 90		Ser	Pro	Gly	Asp 95		
Glu	Glu	Asn	Ile 100	Arg	Arg	Ile	Ala	Glu 105		Ala	Lys	Leu	Phe 110		Asp	
Ala	Gly	Leu 115		Cys	Ile	Thr	Ser 120		Ile	Ser	Pro	Phe 125		Lys	Asp	
Arg	Glu 130		Ala	Arg	Lys	Ile 135		Glu	Ser	Ala	Gly 140		Pro	Phe	Phe	
Glu 145		Phe	Val	Asp	Ala 150		Leu	Asn	Ile	Cys 155		Ser	Arg	Asp	Val 160	
Two	C1	T 011	Тугх	Tva		777	7 ~~	7/1 -	Clar		Tlo	Laze	Gl v	Dhe		

				165					170					175	
Gly	Ile	Asp	Ser 180	Asp	Tyr	Glu	Lys	Pro 185	Glu	Thr	Pro	Glu	Arg 190	Val	Leu
Lys	Thr	Asn 195	Leu	Ser	Thr	Val	Ser 200	Asp	Cys	Val	His	Gln 205	Val	Val	Glu
Leu	Leu 210	Gln	Glu	Gln	Asn	Ile 215	Val	Pro	Tyr	Thr	Ile 220	Ile	Lys	Asp	Ile
His 225	Glu	Leu	Phe	Val	Pro 230	Glu	Asn	Lys	Leu	Asp 235	His	Val	Arg	Ala	Glu 240
Ala	Glu	Thr	Leu	Pro 245	Ser	Leu	Ser	Ile	Thr 250	Lys	Leu	Asp	Leu	Gln 255	Trp
			260					265				Lys	270		
Arg	Glu	Lys 275	Glu	Tyr	Leu	Gln	Val 280	Met	His	Phe	Asp	Thr 285	Leu	Leu	Asp
_	290					295					300	Pro			
305	_	_			310					315		Val			320
_	_	_	_	325					330			Phe		335	
_	_		340		_			345	_	_		Thr	350		
		355		_			360					Trp 365			
_	370					375	_				380	Asp			
385	-				390				_	395	_	Cys			400
				405					410			Pro		415	
_			420					425				Leu	430		
		435					440					Gly 445			
	450					455					460	Gln			
465					470					475		Ile			480
				485					490			Val		495	
-	_		500				_	505			_		510	_	Arg
_		515					520					Asp 525			
	530				_	535					540				Ser
545					550	_				555		Lys			560
				565					570			Phe		575	
	_		580					585					590		Pro
Asp	GLY	Phe 595	Met	Ala	Pro	гÀг	Ala 600	Trp	ьуs	vai	ьeu	Thr 605	Asp	Tyr	ıyr

<210> 8 <211> 617

<212> PRT

<213> Mus musculus

<400> 8

Met Ser Ala Asn Phe Lys Met Asn His Lys Arg Asp Gln Gln Lys Ser 10 Thr Asn Val Val Tyr Gln Ala His His Val Ser Arg Asn Lys Arg Gly Gln Val Val Gly Thr Arg Gly Gly Phe Arg Gly Cys Thr Val Trp Leu Thr Gly Leu Ser Gly Ala Gly Lys Thr Thr Ile Ser Phe Ala Leu Glu Glu Tyr Leu Val Ser His Ala Ile Pro Cys Tyr Ser Leu Asp Gly Asp 70 75 Asn Val Arg His Gly Leu Asn Lys Asn Leu Gly Phe Ser Ala Gly Asp 90 Arg Glu Glu Asn Ile Arg Arg Ile Ala Glu Val Ala Lys Leu Phe Ala 105 Asp Ala Gly Leu Val Cys Ile Thr Ser Phe Ile Ser Pro Phe Ala Lys 125 120 Asp Arg Glu Asn Ala Arg Lys Ile His Glu Ser Ala Gly Leu Pro Phe 135 Phe Glu Ile Phe Val Asp Ala Pro Leu Asn Ile Cys Glu Ser Arg Asp 150 155 Val Lys Gly Leu Tyr Lys Arg Ala Arg Ala Gly Glu Ile Lys Gly Phe 165 170 Thr Gly Ile Asp Ser Asp Tyr Glu Lys Pro Glu Thr Pro Glu Cys Val 185 Leu Lys Thr Asn Leu Ser Ser Val Ser Asp Cys Val Gln Gln Val Val 200 Glu Leu Leu Gln Glu Gln Asn Ile Val Pro His Thr Thr Ile Lys Gly 215 Ile His Glu Leu Phe Val Pro Glu Asn Lys Val Asp Gln Ile Arg Ala 235 230 Glu Ala Glu Thr Leu Pro Ser Leu Pro Ile Thr Lys Leu Asp Leu Gln 245 250 Trp Val Gln Ile Leu Ser Glu Gly Trp Ala Thr Pro Leu Lys Gly Phe 265 Met Arg Glu Lys Glu Tyr Leu Gln Thr Leu His Phe Asp Thr Leu Leu 280 285 Asp Asp Gly Val Ile Asn Met Ser Ile Pro Ile Val Leu Pro Val Ser 295 Ala Asp Asp Lys Ala Arg Leu Glu Gly Cys Ser Lys Phe Ala Leu Met 315 310 Tyr Glu Gly Arg Arg Val Ala Leu Leu Gln Asp Pro Glu Phe Tyr Glu 325 330 His Arg Lys Glu Glu Arg Cys Ser Arg Val Trp Gly Thr Ala Thr Ala 345

Lys His Pro His Ile Lys Met Val Met Glu Ser Gly Asp Trp Leu Val

```
355
                            360
                                                365
Gly Gly Asp Leu Gln Val Leu Glu Arg Ile Arg Trp Asp Asp Gly Leu
                        375
                                            380
Asp Gln Tyr Arg Leu Thr Pro Leu Glu Leu Lys Gln Lys Cys Lys Asp
                    390
                                        395
Met Asn Ala Asp Ala Val Phe Ala Phe Gln Leu Arg Asn Pro Val His
                                    410
Asn Gly His Ala Leu Leu Met Gln Asp Thr Arg Arg Leu Leu Glu
            420
                                425
Arg Gly Tyr Lys His Pro Val Leu Leu His Pro Leu Gly Gly Trp
                            440
                                                445
Thr Lys Asp Asp Asp Val Pro Leu Glu Trp Arg Met Lys Gln His Ala
                        455
Ala Val Leu Glu Glu Arg Val Leu Asp Pro Lys Ser Thr Ile Val Ala
                    470
                                        475
Ile Phe Pro Ser Pro Met Leu Tyr Ala Gly Pro Thr Glu Val Gln Trp
                                    490
His Cys Arg Cys Arg Met Ile Ala Gly Ala Asn Phe Tyr Ile Val Gly
                                505
            500
Arg Asp Pro Ala Gly Met Pro His Pro Glu Thr Lys Lys Asp Leu Tyr
                            520
                                                525
Glu Pro Thr His Gly Gly Lys Val Leu Ser Met Ala Pro Gly Leu Thr
                        535
Ser Val Glu Ile Ile Pro Phe Arg Val Ala Ala Tyr Asn Lys Ile Lys
                    550
                                        555
Lys Ala Met Asp Phe Tyr Asp Pro Ala Arg His Glu Glu Phe Asp Phe
                565
                                    570
Ile Ser Gly Thr Arg Met Arg Lys Leu Ala Arg Glu Gly Glu Asp Pro
                                585
                                                    590
            580
Pro Asp Gly Phe Met Ala Pro Lys Ala Trp Lys Val Leu Thr Asp Tyr
                            600
                                                605
Tyr Arg Ser Glu Met Asp Lys Thr Asn
```

<210> 9 <211> 1845

<212> DNA

<213> Homo sapiens

<400> 9

```
atgeactttg acaccetget agatgatgge gtgateaaca tgageatece cattgtactg 900
cccgtctctg cagaggataa gacacggctg gaagggtgca gcaagtttgt cctggcacat 960
ggtggacgga gggtagctat cttacgagac gctgaattct atgaacacag aaaagaggaa 1020
cgctgttccc gtgtttgggg gacaacatgt acaaaacacc cccatatcaa aatggtgatg 1080
gaaagtgggg actggctggt tggtggagac cttcaggtgc tggagaaaat aagatggaat 1140
gatgggctgg accaataccg tctgacacct ctggagctca aacagaaatg taaagaaatg 1200
aatgctgatg cggtgtttgc attccagttg cgcaatcctg tccacaatgg ccatgccctg 1260
ttgatgcagg acacctgccg caggetecta gagagggget acaagcaccc ggteetecta 1320
ctacaccctc tgggcggctg gaccaaggat gacgatgtgc ctctagactg gcggatgaag 1380
cagcacgcgg ctgtgctcga ggaaggggtc ctggatccca agtcaaccat tgttgccatc 1440
tttccgtctc ccatgttata tgctggcccc acagaggtcc agtggcactg caggtcccgg 1500
atgattgcgg gtgccaattt ctacattgtg gggagggacc ctgcaggaat gccccatcct 1560
gaaaccaaga aggatetgta tgaacccact catgggggca aggtettgag catggeeect 1620
ggcctcacct ctgtggaaat cattccattc cgagtggctg cctacaacaa agccaaaaaa 1680
gccatggact tctatgatcc agcaaggcac aatgagtttg acttcatctc aggaactcga 1740
atgaggaagc tcgcccggga aggagagaat cccccagatg gcttcatggc ccccaaagca 1800
tggaaggtcc tgacagatta ttacaggtcc ctggagaaga actaa
```

<210> 10 <211> 1851 <212> DNA

<213> Mus musculus

<400> 10

atgtctgcaa atttcaaaat gaaccataaa agagaccagc aaaaatccac caatgtggtc 60 taccaggece atcatgtgag caggaacaag agaggacaag tggttggaac caggggagga 120 ttccgaggat gtaccgtgtg gctaacaggt ctctctggtg ctgggaaaac aaccataagc 180 tttgctttgg aagagtacct tgtatctcac gccatcccat gttactccct ggatggggac 240 aatgtccgtc atggccttaa taagaacctg ggattctctg ccggggaccg agaagagaat 300 atcogcogga togcoggaggt ggccaagete tttgccgaeg coggectggt ttgcatcace 360 agetttatet eteettttge aaaggategt gagaatgeee gaaaaateea egaateagea 420 ggactecegt tetttgagat etttgtagat gegeetttaa atatetgtga aageegagae 480 gtaaaaggac tctacaaacg agcccgagca ggagagatta aagggtttac aggcatcgat 540 tetgaetatg agaaacetga aacteeagag tgtgtgetga agaecaaett gtetteagta 600 agcgactgtg tgcaacaggt ggtggaactt ttgcaggagc agaacattgt accccacacc 660 accatcaaag gcatccacga actctttgtg ccagaaaaca aagtcgatca aatccgagct 720 gaggcagaga ctctcccatc actaccaatt accaagctgg atctgcagtg ggtgcagatt 780 ctgagtgaag gctgggccac tcccctcaaa ggctttatgc gggagaagga atacttgcaa 840 actetacaet tegacaetet aetggaegat ggagteatea aeatgagtat teccattgta 900 ttgcccgttt ctgcggatga caaggcacgg ctcgaagggt gcagcaaatt tgccttgatg 960 tacgaaggtc ggagggtcgc tctattacag gaccctgaat tctatgagca taggaaagag 1020 gagcgttgtt ctcgtgtgtg gggaacagcc actgcaaagc acccccatat caaaatggtg 1080 atggaaagtg gggactggct tgttggtgga gacctacagg tgctagagag aataaggtgg 1140 gacgatgggc tggaccaata ccgccttacg cctctggaac tcaaacagaa gtgtaaagac 1200 atgaatgctg atgccgtgtt tgcattccag ttgcgcaatc ctgtccacaa tggtcatgcc 1260 ctcctgatgc aggacacccg ccgcaggctc ctggagaggg gttacaagca cccagtcctc 1320 ctgctccacc ctcttggggg ctggaccaag gacgatgacg tacctctgga atggaggatg 1380 aaacagcatg cagctgtact ggaggaaagg gtcctggatc ccaagtcaac tattgttgcc 1440 atctttccat ctcctatgtt atacgctggt cccacagagg tccagtggca ttgcagatgc 1500 cggatgattg caggagccaa tttctacatt gtgggtaggg atcccgcagg aatgccccat 1560 cctgagacaa agaaagacct atatgaaccc acccacgggg gcaaggtctt gagtatggcc 1620 cctggcctta cctctgtgga aataattccg ttccgagtgg ctgcctacaa taaaattaaa 1680 aaggccatgg acttttatga tccagcaagg cacgaggagt ttgacttcat ctcaggaact 1740 cgcatgagga agctcgcccg ggaaggagaa gatcccccag atggcttcat ggccccgaaa 1800 gcgtggaaag tgttgacaga ttactacagg tctctggaga agaccaacta g 1851

<210> 11 <211> 21 <212> DNA			
<213> Homo	sapiens		
<400> 11 gccagccagc	atgtcgggga	t	21
<210> 12 <211> 24 <212> DNA <213> Homo	saniens		
<400> 12	Supiens		
	cctgagcgtg	tgct	24
<210> 13 <211> 21 <212> DNA			
<213> Homo	sapiens		
<400> 13 gatgtgcctc	tagactggcg	g	21
<210> 14 <211> 24 <212> DNA <213> Homo	ganieng		
<400> 14	sapiens		
	gaaagaaact	ctgg	24
<210> 15 <211> 21 <212> DNA			
<213> Homo	sapiens		
<400> 15 catccgccag	tctagaggca	с	21
<210> 16 <211> 21 <212> DNA <213> Homo	sapiens		
<400> 16			
	cggtattggt	С	21
<210> 17 <211> 23 <212> DNA <213> Homo	saniens		
<400> 17			

gtcactcact gtggacaaat tgg	23
<210> 18	
<211> 21	
<212> DNA	
<213> Homo sapiens	
<400> 18	
cacctcagca atccggcgga t	21
<210> 19	
<211> 20	
<212> DNA	
<213> Mus musculus	
<400> 19	
tctggcacaa agagttcgtg	20
<210> 20	
<211> 22	
<212> DNA	
<213> Mus musculus	
400. 20	
<400> 20	22
gccagtttgt aaccgagtat tc	22
<210> 21	
<211> 22	
<211> 22 <212> DNA	
<213> Mus musculus	
(213) Mus musculus	
<400> 21	
gcaattggat acagagcagc ta	22
<210> 22	
<211> 22	
<212> DNA	
<213> Mus musculus	
<400> 22	
gacaatgtcc gtcatggcct ta	22
<210> 23	
<211> 21	
<212> DNA	
<213> Mus musculus	
<400> 23	<u> </u>
attcccattg tattgcccgt t	21
.210- 24	
<210> 24 <211> 21	
<211> 21 <212> DNA	
<212> DNA <213> Mus musculus	
72137 MUS MUSCULUS	

<400> 24 aacgggcaat acaatgggaa t	21
<210> 25 <211> 22 <212> DNA	
<213> Mus musculus	
<400> 25 gataaagctg gtgatgcaaa cc	22
<210> 26 <211> 20	
<212> DNA	
<213> Mus musculus	
<400> 26	
catgggatgg cgtgagatac	20
<210> 27	
<211> 23	
<212> DNA <213> Mus musculus	
<213> Mus musculus	
<400> 27	
cataagettt getttggaag agt	23
<210> 28	
<211> 21	
<212> DNA	
<213> Homo sapiens	
<400> 28	
gcatgtccag acagacacca c	21